

CLAIMS

1. A device for treating skin on the body of a subject, comprising:

a plurality of electrodes, which are adapted to be placed in contact with the skin and then moved across the skin while maintaining electrical contact with the skin; and

a power source, which is adapted to apply a current between two or more of the plurality of electrodes at the same time as the electrodes are being moved across the skin.

2. A device according to claim 1, wherein the power source is adapted to apply the current such that skin layers beneath stratum corneum epidermidis of the skin are substantially not ablated.

3. A device according to claim 1, wherein the power source is adapted to apply the current so as to ablate stratum corneum epidermidis of the skin.

4. A device according to claim 1, and comprising a marking unit, adapted to apply a substance to the skin so as to demarcate a region of the skin to which the current is applied.

5. A device according to claim 1, wherein the device comprises one or more protrusive elements, adapted to press the skin so as to demarcate a region of the skin to which the current is applied.

6. A device according to claim 1, wherein at least one of the electrodes is adapted to contact the skin to create a

contact area having a characteristic length of between about 10 and 100 microns.

7. A device according to claim 1, wherein at least one of the electrodes comprises a bipolar electrode.

8. A device according to claim 1, wherein the two or more electrodes comprise a return electrode and two or more current-driving electrodes, and wherein the power source is adapted to apply respective currents between each of the current-driving electrodes and the return electrode.

9. A device according to claim 1, wherein the power source is adapted to apply the current in order to allow a substance to pass through the skin.

10. A device according to claim 9, wherein the power source is adapted to apply the current in order to allow a substance to pass through the skin into the body of the subject.

11. A device according to claim 9, wherein the power source is adapted to apply the current in order to allow a substance to pass through the skin from within the body of the subject.

12. A device according to claim 1, and comprising a substance application unit, adapted to apply a substance to the skin at a site on the skin to which the current is applied.

13. A device according to claim 12, wherein the substance application unit comprises:

a spool, adapted to rotate as the device moves across the skin; and

a substance application strip having the substance applied thereto, which strip is adapted to be disposed

around the spool, so as to unwind from the spool as the device is moved across the skin, and so as to cover the site on the skin to which the current is applied.

14. A device according to claim 13, wherein the substance application strip comprises an adhesive, adapted to hold the strip in contact with the skin.

15. A device according to claim 12, wherein the substance application unit comprises:

a reservoir, adapted to contain a dose of the substance; and

a conduit, coupled to the reservoir so as to transport the substance to the site.

16. A device according to claim 15, wherein the conduit is adapted to provide a desired flow rate of the substance.

17. A device according to claim 15, wherein the substance application unit comprises a porous material, through which the substance passes during transport to the skin, so as to provide a desired flow rate of the substance.

18. A device according to claim 15, wherein the substance application unit comprises a pump, coupled to the reservoir, which is adapted to provide a desired flow rate of the substance.

19. A device for treating skin on the body of a subject, comprising:

a roller, adapted to rotate when it is moved across the skin;

a plurality of electrodes, disposed over a surface of the roller, so as to be placed in sequence into contact with the skin as the roller is moved across the skin; and

a power source, which is adapted to drive a current through each electrode when the electrode is in contact with the skin.

20. A device according to claim 19, wherein the power source is adapted to apply the current such that skin layers beneath the stratum corneum epidermidis are substantially not ablated.

21. A device according to claim 19, wherein the power source is adapted to apply the current so as to ablate stratum corneum epidermidis of the skin.

22. A device according to claim 19, and comprising a marking unit, adapted to apply a marking substance to the skin so as to demarcate a region of the skin to which the current is applied.

23. A device according to claim 19, wherein the device comprises one or more protrusive elements, adapted to press the skin so as to demarcate a region of the skin to which the current is applied.

24. A device according to claim 19, wherein at least one of the electrodes is adapted to contact the skin to create a contact area having a characteristic length of between about 10 and 100 microns.

25. A device according to claim 19, wherein at least one of the electrodes comprises a bipolar electrode.

26. A device according to claim 19, wherein the plurality of electrodes comprise a return electrode and two or more current-driving electrodes, and wherein the power source is adapted to apply respective currents between each of the current-driving electrodes and the return electrode.

27. A device according to claim 19, wherein the power source is adapted to apply the current in order to allow a substance to pass through the skin.
28. A device according to claim 27, wherein the power source is adapted to apply the current in order to allow a substance to pass through the skin into the body of the subject.
29. A device according to claim 27, wherein the power source is adapted to apply the current in order to allow a substance to pass through the skin from within the body of the subject.
30. A device according to claim 19, and comprising a substance application unit, adapted to apply an active substance to the skin at a site on the skin to which the current is applied.
31. A device according to claim 30, wherein the substance application unit comprises:
  - a spool, adapted to rotate as the device moves across the skin; and
  - a substance application strip having the substance applied thereto, which strip is adapted to be disposed around the spool, so as to unwind from the spool as the spool is moved across the skin, and so as to cover the site on the skin to which the current is applied.
32. A device according to claim 31, wherein the substance application strip comprises an adhesive, adapted to hold the strip in contact with the skin.
33. A device according to claim 30, wherein the substance application unit comprises:

a reservoir, adapted to contain a dose of the substance; and

a conduit, coupled to the reservoir so as to transport the substance to the site.

34. A device according to claim 33, wherein the conduit is adapted to provide a desired flow rate of the substance.

35. A device according to claim 33, wherein the substance application unit comprises a porous material, through which the substance passes during transport to the skin, so as to provide a desired flow rate of the substance.

36. A device according to claim 33, wherein the substance application unit comprises a pump, coupled to the reservoir, which is adapted to provide a desired flow rate of the substance.

37. A device for treating skin on the body of a subject, comprising:

a housing;

a plurality of electrodes, disposed on a surface of the housing, which are adapted to be placed in contact with the skin;

a motion sensor, which is adapted to generate a sensor signal responsive to motion of the housing; and

a control unit, which is adapted to receive the sensor signal, to determine, responsive thereto, a physical disposition of the device, and to control current flow to the plurality of electrodes responsive to determining the physical disposition.

38. A device according to claim 37, wherein the control unit is adapted to determine a velocity of the device and

to control the current flow to the electrodes responsive thereto.

39. A device according to claim 38, wherein the control unit is adapted to terminate the current flow if the velocity is outside of a specified operating range.

40. A device according to claim 37, wherein the control unit is adapted to determine a distance traveled by the device, and to control the current flow to the electrodes responsive thereto.

41. A device according to claim 40, wherein the control unit is adapted to terminate the current flow after the device has traveled a specified distance.

42. A device according to claim 37, wherein the control unit is adapted to determine an acceleration of the device and to control the current flow to the electrodes responsive thereto.

43. A device according to claim 42, wherein the control unit is adapted to terminate the current flow if the acceleration is outside of a specified operating range.

44. A device according to claim 37, and comprising an output unit, coupled to the control unit, wherein the control unit is adapted to actuate the output unit to generate an output signal indicative to the subject of the physical disposition of the device.

45. A device according to claim 44, wherein the output unit comprises a speaker, and wherein the control unit is adapted to actuate the speaker responsive to the physical disposition.

46. A device according to claim 44, wherein the output unit comprises a display, and wherein the control unit is adapted to actuate the display responsive to the physical disposition.

47. A device according to claim 37, and comprising a marking unit, adapted to apply a marking substance to the skin so as to demarcate a region of the skin to which current is applied.

48. A device according to claim 37, and comprising a substance application unit, adapted to apply an active substance to the skin at a site on the skin to which current is applied.

49. A device according to claim 48, wherein the substance application unit comprises:

a spool, adapted to rotate as the device moves across the skin; and

a substance application strip having the substance applied thereto, which strip is adapted to be disposed around the spool, so as to unwind from the spool as the spool is moved across the skin, and so as to cover the site on the skin to which the current is applied.

50. A device according to claim 48, wherein the substance application unit comprises:

a reservoir, adapted to contain a dose of the substance; and

a conduit, coupled to the reservoir so as to transport the substance to the site.

51. A device according to claim 50, wherein the conduit is adapted to provide a desired flow rate of the substance.

52. A device according to claim 50, wherein the substance application unit comprises a pump, coupled to the reservoir, which is adapted to provide a desired flow rate of the substance.

53. A device for treating skin on the body of a subject, comprising:

    a housing;

    a plurality of electrodes, disposed on a surface of the housing, which are adapted to be placed in contact with the skin and to apply a current to the skin;

    a motion sensor, which is adapted to generate a sensor signal responsive to motion of the housing;

    an output unit; and

    a control unit, which is adapted to receive the sensor signal, to determine, responsive thereto, a physical disposition of the device, and to actuate the output unit to generate an output signal indicative to the subject of the physical disposition of the device.

54. A device according to claim 53, wherein the control unit is adapted to determine a velocity of the device and to actuate the output unit to generate the output signal responsive to the velocity of the device.

55. A device according to claim 53, wherein the control unit is adapted to determine an acceleration of the device and to actuate the output unit to generate the output signal responsive to the acceleration of the device.

56. A device according to claim 53, wherein the control unit is adapted to determine a distance traveled by the device and to actuate the output unit to generate the

output signal responsive to the distance traveled by the device.

57. A device according to claim 53, wherein the output unit comprises a speaker and wherein the control unit is adapted to actuate the speaker responsive to the disposition.

58. A device according to claim 53, wherein the output unit comprises a display and wherein the control unit is adapted to actuate the display responsive to the disposition.

59. A device according to claim 53, and comprising a substance application unit, adapted to apply an active substance to the skin at a site on the skin to which the current is applied.

60. A device for causing a pharmaceutical substance to enter a bloodstream of a subject through a site on skin of the subject, comprising:

a housing;

a spool, coupled to the housing, which is adapted to rotate when the housing is moved across the skin; and

a substance application strip having the substance applied thereto, which strip is adapted to be disposed around the spool, so as to unwind from the spool as the housing is moved across the skin, and to cover the site on the skin, such that the pharmaceutical substance travels through the skin and enters the bloodstream.

61. A device according to claim 60, and comprising a plurality of electrodes, adapted to apply a current to sites on the skin, wherein the substance application strip

is adapted to have the substance applied to discrete sites of the strip which correspond to the sites on the skin.

62. A device according to claim 60, wherein the substance application strip is divided into sections, wherein each section has a dose of the substance applied thereto, and wherein each section is arranged to be removed from the strip following unwinding of the section from the spool.

63. A method for treating skin on the body of a subject, comprising;

placing a plurality of electrodes in contact with the skin;

moving the electrodes across the skin while maintaining their electrical contact with the skin; and

driving a current between two or more of the plurality of electrodes at the same time as the electrodes are being moved across the skin.

64. A method according to claim 63, wherein driving the current comprises configuring a parameter of the current such that skin layers beneath stratum corneum epidermidis of the skin are substantially not ablated by the current.

65. A method according to claim 63, wherein driving the current comprises configuring a parameter of the current such that stratum corneum epidermidis of the skin is ablated by the current.

66. A method according to claim 63, and comprising applying a marking substance to the skin so as to demarcate a region of the skin to which the current is applied.

67. A method according to claim 63, wherein driving the current comprises driving the current in a bipolar mode.

68. A method according to claim 63, wherein driving the current comprises driving the current in a monopolar mode.

69. A method according to claim 63, wherein driving the current comprises configuring a parameter of the current so as to allow a substance to pass through the skin.

70. A method according to claim 69, and comprising delivering a substance into the skin at a site on the skin to which the current is applied.

71. A method according to claim 69, and comprising extracting a substance through the skin at a site on the skin to which the current is applied.

72. A method according to claim 63, and comprising applying an active substance to the skin at a site on the skin to which the current is applied.

73. A method according to claim 72, wherein applying the substance comprises regulating a flow rate of the substance.

74. A method according to claim 72, wherein applying the substance comprises actively pumping the substance.

75. A method for treating skin on the body of a subject, comprising:

placing a plurality of electrodes in contact with the skin in sequence; and

driving a current through each of the electrodes when the respective electrode is in contact with the skin.

76. A method according to claim 75, wherein driving the current comprises configuring a parameter of the current such that skin layers beneath stratum corneum epidermidis of the skin are substantially not ablated by the current.

77. A method according to claim 75, wherein driving the current comprises configuring a parameter of the current such that stratum corneum epidermidis of the skin is ablated by the current.

78. A method according to claim 75, and comprising applying a marking substance to the skin so as to demarcate a region of the skin to which the current is applied.

79. A method according to claim 75, wherein driving the current comprises driving the current in a bipolar mode.

80. A method according to claim 75, wherein driving the current comprises driving the current in a monopolar mode.

81. A method according to claim 75, wherein driving the current comprises configuring a parameter of the current so as to allow a substance to pass through the skin.

82. A method according to claim 81, and comprising delivering a substance into the skin at a site on the skin to which the current is applied.

83. A method according to claim 81, and comprising extracting a substance through the skin at a site on the skin to which the current is applied.

84. A method according to claim 75, and comprising applying an active substance to the skin at a site on the skin to which the current is applied.

85. A method according to claim 84, wherein applying the substance comprises regulating a flow rate of the substance.

86. A method according to claim 84, wherein applying the substance comprises actively pumping the substance.

87. A method for treating skin on the body of a subject, comprising:

    placing a plurality of electrodes in contact with the skin;

    determining a physical disposition of the electrodes; and

    driving a current between two or more of the plurality of electrodes responsive to the disposition of the electrodes.

88. A method according to claim 87, wherein driving the current comprises driving the current responsive to a velocity of the electrodes.

89. A method according to claim 87, wherein driving the current comprises driving the current responsive to a distance traveled by the electrodes.

90. A method according to claim 89, and comprising terminating the current responsive to the electrodes having moved a specified distance.

91. A method according to claim 87, wherein driving the current comprises driving the current responsive to an acceleration of the electrodes.

92. A method according to claim 87, and comprising indicating to the subject the physical disposition of the electrodes.

93. A method according to claim 92, wherein indicating the disposition comprises generating an audible indication.

94. A method according to claim 92, wherein indicating the disposition comprises generating a visual indication.

95. A method according to claim 87, and comprising applying a pharmaceutical substance to the skin at a site on the skin to which the current is applied.

96. A method for treating skin on the body of a subject, comprising:

    placing a plurality of electrodes in contact with the skin;

    driving a current between two or more of the plurality of electrodes;

    determining a physical disposition of the electrodes; and

    generating an output signal indicative to the subject of the physical disposition of the electrodes.

97. A method according to claim 96, wherein generating the output signal comprises generating the signal responsive to a velocity of the electrodes.

98. A method according to claim 96, wherein generating the output signal comprises generating the signal responsive to an acceleration of the electrodes.

99. A method according to claim 96, wherein generating the output signal comprises generating the signal responsive to a distance traveled by the electrodes.

100. A method according to claim 96, wherein generating the output signal comprises generating an audible signal.

101. A method according to claim 96, wherein generating the output signal comprises generating a visual signal.

102. A device for treating skin on the body of a subject, comprising:

a plurality of receiving electrodes, which are adapted to be placed in contact with the skin so as to provide electrical contact with the skin;

a driving electrode, which is adapted to be passed across the receiving electrodes so as to create electrical contact with a first one of the receiving electrodes prior to creating electrical contact with a second one of the receiving electrodes; and

a power source, which is adapted to drive the driving electrode to apply a first current to the first receiving electrode when the driving electrode is in electrical contact with the first receiving electrode, and to apply a second current to the second receiving electrode when the driving electrode is in electrical contact with the second receiving electrode.

103. A device according to claim 102, wherein the device comprises a patch, fixed to the receiving electrodes, which patch is adapted to be applied to the skin.

104. A device according to claim 102, wherein at least one of the receiving electrodes comprises a monopolar electrode.

105. A device according to claim 102, wherein the power source is adapted to drive the driving electrode to apply the first current at a magnitude sufficient to ablate stratum corneum of the skin.

106. A device according to claim 102, wherein the power source is adapted to drive the driving electrode to apply the first current through the first receiving electrode into a site on the skin, and wherein the device comprises a

substance application unit, adapted to apply a substance to the skin at the site.

107. A device according to claim 1, wherein the power source is adapted to apply the current so as to ablate stratum corneum epidermidis of the skin, and, at least partially, a layer of the skin deeper than the stratum corneum epidermidis.

108. A device according to claim 19, wherein the power source is adapted to drive the current so as to ablate stratum corneum epidermidis of the skin, and, at least partially, a layer of the skin deeper than the stratum corneum epidermidis.

109. A method according to claim 63, wherein driving the current comprises configuring a parameter of the current such that the current ablates stratum corneum epidermidis of the skin, and, at least partially, a layer of the skin deeper than the stratum corneum epidermidis.

110. A method according to claim 75, wherein driving the current comprises configuring a parameter of the current such that the current ablates stratum corneum epidermidis of the skin, and, at least partially, a layer of the skin deeper than the stratum corneum epidermidis.

111. A device according to claim 102, wherein the power source is adapted to drive the driving electrode to apply at least one of the currents at a magnitude sufficient to ablate stratum corneum epidermidis of the skin, and, at least partially, a layer of the skin deeper than the stratum corneum epidermidis.